

REMARKS
ON THE
HISTORY AND ETIOLOGY OF CHOLERA.

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IN the following observations, which may be regarded as the sequel of the paper in last number, I do not propose to attempt a formal refutation of the doctrine of contagion as a cause of the propagation of cholera, but merely to place before my readers such facts and arguments as may assist them in forming an opinion of the validity of this doctrine. In my account of the epidemic of Newburn, I considered the merits of this question as fully as the history of the disease then admitted; and I have since, in various articles, entered more or less extensively and minutely into the consideration of several other points of the inquiry. I was at one time censured for not coming to an earlier decision of the question. But to this I can make various answers, which are at least satisfactory to myself, and I trust will appear so to unbiassed judges. In the first place, no good could result from any individual stating his own opinions, persuasions, and convictions, in language however strong and decided; and I at all events was determined not to do so without personal examination of those circumstances, which must be regarded as evidence on both sides, and which only could render any opinion conclusive. In the second place, I observed that almost the whole of the public authorities and boards throughout the kingdom, had either positively declared their belief in the contagious nature of the disease, or had in this belief prescribed sanative measures and precautions; and in such circumstances, after a plain and distinct statement of facts and arguments, it must have indicated both arrogance and at the same time imprudent opposition, to say more on the subject. In such circumstances, the result of an expression of difference of opinion could do no good, and might have been productive of injury. In the third place, this course enabled me, during many months observation of the disease, to collect a considerable number of facts on the question of its mode of introduction and propagation in different places.

In the following article I shall consider, *1st*, the question of cholera being a new disease; *2d*, the mode in which the first cases took place; *3d*, the mode in which the disease subsequently spread; and *4th*, the question of propagation by the dead subject.

I. The first argument by which it is attempted to be proved that cholera is propagated by contagion, is that it is a new disease, and was never known in India before the year 1817, when it appeared in the Delta of the Ganges in an epidemic form. It is very singular that this assertion could ever be made, and more so that it could be repeated, after the distinct statements to the contrary by Mr Jameson. The testimony of various credible authorities can be adduced to prove, that the disease has been endemial from time immemorial in India; and it may be even shown that it has been well known in other countries.

I am willing to admit, that in some instances the peculiar characters of the discharges have been overlooked by some observers, and that this has given some ground to the assertion that, though ordinary cholera has been long known, the virulent form of the disease, with the sero-albuminous discharges, and collapsed state of the vascular system with which we have become of late so familiar, is entirely new. I trust that before the remarks in the present paper are concluded, I shall show that even this mode of explanation cannot be employed with propriety.

It may seem perhaps, on the ground now stated, superfluous to attach much importance to the descriptions of the ancient physicians. I must remark, however, that the writings of these authors, present unequivocal proofs that they were familiar with a disease which, in all its essential features, resembled accurately the exquisite cases of virulent or malignant cholera.

Aretæus, commonly named the Cappadocian, is the first writer whose authority I shall adduce on this point. This physician, whose age is uncertain, but who is on good evidence, believed to have flourished previous to the time of the Emperor Titus, and not later than that of Trajan or Adrian, describes under the name of cholera, a most acute disease, (*αξυτατον κακον*) in which the matter of the whole frame, is carried by a retrograde motion (*παλινοστροφου φορη*) into the œsophagus, stomach, and bowels; in which the vomited matters are watery, and ejected with great force, and the intestinal discharges, though feculent, are fluid and mucous; in which, as the disease proceeds, the muscles of the arms and legs are cramped, the fingers become incurvated (*δακτυλοι καμπυλοι*) the nails blue (*ονυχεις πελιδνοι*) the extremities cold, and the whole body stiff (*το ολον ριγωδες*), and covered with sweat; in which urine is not secreted, because the fluids are diverted into the intestines (*υπο της εν το εντερον των υγρων μεταχρετευσεως*) the voice is lost, and the pulse becomes very small and frequent, as in syncope; and in which, after continued ineffectual efforts to vomit and calls to stool without discharging any thing, death takes place by convulsion, suffocation and retching, (*εμετω κενω*.) *

It is singular, that while he specifies the watery vomiting, and the watery and mucous stools, Aretæus states, that yellow bile is discharged both ways in the established disease, and black bile while the extremities are cold and blue,—a statement into which he has been led, I conceive, by his desire not to depart too widely from the definition of Hippocrates and his followers. It is on the contrary remarkable, that before the fatal event, he states, that there are constant efforts to vomit without discharging anything, and calls to stool equally ineffectual, (*προθυμιαι τεινεσμωνδες, ξηραι, αχυλοι*) dry and without fluid. That in this disease no bile was discharged at this period, is manifest from a direction

* ΑΡΕΤΑΙΟΥ ΚΑΠΠΑΔΟΚΟΥ περι Αιτιαν και Σημειαν Οξυαν και Χρηνικαν Παθων Βιβλ. Δευτ. κει. ε περι χολερας. Lugd. Bat. 1735, fol.

which he afterwards in the treatment gives the physician, to continue his remedies till feculent matters are evacuated from the rectum, and bilious from the stomach, and the heat returns to the surface and extremities. His final therapeutic direction is very remarkable. "If, on the contrary, he concludes, everything is rejected by vomiting, if sweat flows incessantly, if the patient becomes cold and livid, ($\psiυχρος \delta\epsilon \kappa\alpha\iota \pi\epsilon\lambda\iota\omicron\varsigma$), and the pulse proceeds to extinction and total failure, it is good in such circumstances to make a decent retreat."* Can this assemblage and train of symptoms, I beg to ask, apply to any other disease than the virulent and exquisite cases of cholera which we have lately witnessed? Nothing can be more characteristic than the use of the terms $\pi\epsilon\lambda\iota\omicron\varsigma$ and $\pi\epsilon\lambda\iota\delta\nu\omicron\varsigma$ to designate the blue or leaden colour of choleric cases at the close of life. Both terms are derived from $\pi\epsilon\lambda\omicron\varsigma$ *niger, fuscus*; and $\pi\epsilon\lambda\iota\delta\nu\omicron\varsigma$, as well as $\pi\epsilon\lambda\iota\omicron\varsigma$, is more particularly used to denote a leaden colour of the surface—the one certainly most common in the stage of collapse.

It appears from the testimony, both of Cœlius Aurelianus and Alexander of Tralles, that considerable difference of opinion was entertained by physicians previous to them, and also by their contemporaries, on the nature of the fluids evacuated in cholera. The dispute appears to have originated in an etymological controversy, in which those who derived the term from $\chi\omicron\lambda\eta$ the word for bile, maintained that this was the fluid evacuated, as if it were the *passio fellistua*; while another party, who could not overlook the fact that the discharges were not bilious, derived the name of the disease from the quantity of fluids evacuated.†

Asclepiades, for example, represented cholera to consist in a *discharge of fluid, rapid and sudden from the stomach and intestines, (humoris fluor celer ac parvi temporis, ventris atque intestinorum)*, originating from indigestion. In this definition others remarked, that the discharge of fluid constituted the general character of cholera, and that the short space of time was added, to distinguish it from the *fluxus cœliacus*, which is a chronic affection,—a better proof that Asclepiades held cholera to consist in a discharge of white or watery fluid. Aurelianus justly observed, that the introduction of the causes, either immediate or remote, in the definition was superfluous; and that while the admission of the atoms peculiar to the sect of the methodical physicians was gratuitous, that of antecedent circumstances is still more so, because, he adds, neither is the choleric disease the only result of indigestion, nor does indigestion alone cause that malady. He therefore concludes, that it is unnecessary to dispute about the etymology, and that cholera is a

* $\text{Αρξεταιίου Καππαδοχίου περι Θεραπειας Οξέων και Χρονικών Παθών Βιβλ., II. κεφ. δ}$

† Cælii Aureliani Siccensis de Morbis Acutis et Chronicis, lib. iii. cap. xix.

copious and sudden discharge of fluid from the stomach and bowels, occurring spontaneously, and independent of indigestion.

In his subsequent detail of the causes of the disease, he enumerates a train of symptoms, which certainly make a nearer approach to those of the malignant cholera of the East, than to any other known disease. As the complaint proceeds, he states that the alvine discharge consists of a thin watery liquor, and is sometimes like washings of meat, (*aquati atque tenuis liquoris fit egestio, et aliquando similis loturæ carnis,*) and along with these a whitish frothy or floeculent matter, (*subalbida desputa*).*

It is almost unnecessary to remind the reader, that in many places in this country during the late epidemic, the choleric fluid was described as similar to water in which meat had been washed, and that the wine-lee discharges which were observed in severe cases, are in all probability the extreme degree of this form. But even Aurelianus afterwards remarks this very sort of discharge under the character,—*aliquando etiam egestio ventris sanguinolenta*. The *subalbida desputa* bear so close a resemblance to the frothy gruelly fluids, that it will be recognized by all, when merely mentioned.

The other characters of this disease given by Cœlius Aurelianus are still more strongly and unequivocally specified. Thus we have the rapidity of pulse and respiration, coldness of the extremities, the dark livid colour of the countenance, (*vultus nigrore fuscatus*), and shrinking of the features, (*vultus in maciem atque tenuitatem deducti,*) the epigastric constriction (*præcordiorum ad superiora raptus, cum dolore iliaco simili,*) and the cramps of the legs and arms, (*contractio vel conductio membrorum, cum nervorum tensione, ac surarum et brachiorum.**)

No mention is here made of bile or bilious discharges, or affection of the liver; and, on the contrary, Aurelianus expressly says, that the stomach and intestines suffer most by this disease, and that with these the other parts of the system sympathise.

In the circumstance of rapidity also, the resemblance is equally accurate as in other respects; for it was mentioned by those whom he at that time names *ancients*, that it was a most acute and rapid disease, which never lasted till the second day.

The work of Cœlius Aurelianus, however valuable it may appear to us, was probably not very widely circulated. At all events, his description, which was partly derived from personal observation, and partly translated from the Greek of his model, Soranus, the Ephesian, appears to have failed to rectify the mistakes then prevalent as to the nature of the discharges. It is not wonderful that Aetius of Amida, whose *Tetrabiblion* was

* Cœlii Aureliani Siccensis de Morb. Acut. lib. iii. cap. xx.

indeed a compilation from all other authors, gives a short and unsatisfactory definition of the disease, in which he merely mentions bilious, fetid, and acid vomiting and alvine discharges, followed by thirst, sweat, interrupted pulse, and spasmodic contractions of the muscles of the hands and feet, but especially of the calves of the legs. In his therapeutic directions, however, it is manifest that he had in view a very formidable disease, in which, when the discharge was excessive, (*αμετρος*), the pulse became very weak, the surface cold and moist, and the patient was tortured with hiccups, intense thirst, and spasms of the muscles. It is farther important to remark, that the copiousness of the discharge in one passage he ascribes to the operation of a poison irritating the stomach and bowels, and drawing thither the fluids from the whole body.*

In the short and rather desultory sketch given by Paul of Aegina no mention is made of bile or bilious matter; but the disease is designated as an extraordinary disturbance of the stomach, causing vomiting and purging; and in a passage in the second book on fainting (*λειποθυμια*), he mentions that symptom as the consequence of cholera and diarrhœa and other excessive evacuations. †

Alexander of Tralles, on the contrary, a physician who flourished towards the middle of the sixth century, under Justinian the Great, takes particular pains to rectify the mistake with regard to the nature of the fluids discharged in cholera. After stating that cholera is allowed by all to be a most acute distemper, inducing remarkable faintness and extraordinary loss of power (*καταλυσιν αμετρον της δυναμειως*), and therefore admitting no delay, and demanding the most speedy assistance, he defines it as an inordinate disturbance of the stomach and bowels, (*αμετρος εκταραξις η δια γαστρος και εμετων γινομενη επ ανατροπη και κακωσει του στομαχου*.) He then recommends that no one should imagine that the disease is so named, because it is wont to be occasioned entirely by bile; but since they must see that the whole matter discharged from the alimentary canal is excreted from the intestines; (*αλλ επειδη δια των εντερων εθεωρουν εκκρινομενην την δια γαστρος προς φερομενην ολην*); and as these were denominated by the ancients *χολαδες*, it is on this account that the disease is termed *χολερα*. ‡

Whatever opinion be entertained on the justice of this etymology, it is impossible to deny that Alexander of Tralles gives in the passage here referred to a correct view of the source of the fluids discharged, and a view the justice of which has been con-

* Λετιου Τετραβιβλιου, iii. 10.

† Παυλου Αιγινητου Ιατρου αριζου βιβλ. iii. λθ. 37.

‡ Αλεξανδρου Τραλλιανου βιβλ. εβδ κερ. iv.

firmed by modern observation. It is further no inconsiderable proof of the accuracy of the observation of this physician, that he admits the formation of cholera from various causes; and with a view to treatment distinguishes three varieties; one from indigestible or improper food, which is not proper cholera, he adds; another from redundant bile, which is free from danger; and a third, from some peculiar disorder of the stomach, the one which he evidently regards as most violent and severe. In this variety of the distemper, he adds, if the strength fails, the extremities become cold, and spasms and collapse (*συστολι*) take place, it is proper to give wine with decoction of mint. For by its efficacy above all agents in rapidly recalling the sinking powers, he had known many unexpectedly rescued from death.* The term *συστολι*, which I have rendered collapse, signifies literally *contraction* or *shrinking*; and as the verb from which it is derived is occasionally used by the Greek authors to indicate the effect of any of the depressing passions, I think it evidently proves, that the context indicates the state of the former denominated collapse.

The description of John the son of Zacharias, physician to the court of Andronicus Palaeologus, and commonly known under the name of *Actuarius*, though less specific than that of Aretæus and Cœlius Aurelianus, affords nevertheless information on the discharges and their effects sufficiently characteristic to claim attention. After speaking of the preternatural increase of fluids from the alimentary canal by turgescence, as he calls it, or excitement of the expulsive faculty, he adds the remark, that this also must not be overlooked, that occasionally the intestinal discharge passes into cholera, and gushes forth in some instances both upwards and downwards, in others downwards only. The dejections, then both appear watery-bilious (*ἰδατοχολα*), and are so denominated; and if they are very abundant, and not opposed by remedies, they produce weakness, faintness, *syncope* and coldness of the whole surface. He at the same time adds, that whitish milky discharges, void of consistence, (*quæ excernuntur subalbida, et lactea, nec cohaerantia*) indicate excessive feebleness of the digestive and assimilative functions, in consequence of the excessive chilling of the living frame; and immediately after distinguishes this discharge from those which are brown and yellow, and which arise from redundant bile.

These testimonials of the ancient physicians show that they were aware of the existence of a disease commencing with vomiting and purging, first of the contents of the stomach and bowels, and then of an immense quantity of scrous or watery fluid,

* Alexandri Tralliani, lib. vii. cap. xiv.

occasionally with whitish opaque fluid, and followed by cramps of the limbs, weakness and failure of the pulse, loss of voice, contraction, and more or less discoloration of the surface, cold sweats, cold extremities, hiccup, and death,—in short, all the symptoms of genuine cholera. The only difference is, that we do not hear of its occurrence in the epidemic shape. This, however, is foreign to the question; and it is sufficient that the existence of the disease in ancient times is irrefragably demonstrated.

By what means has the knowledge of these facts been lost or overlooked, it may be asked? Did the disease cease to appear in the virulent shape described by Aretæus, Cœlius Aurelianus, Theodore Priscian and Actuarius; or were the facts recorded by these authors neglected amidst the general ignorance of the middle ages? The Europeans then received most of their medical information from the Arabian physicians; and the only mode in which this oversight can be explained is by supposing that these learned but fanciful persons had neglected to give a description of cholera as accurate as that of their Grecian preceptors. It is, however, a fact not less true than singular, that not even this excuse is left to the defenders of the new origin of cholera. The disease is described under the name of *choleric affection or passion* in the pages of Mesue, Serapion, Abubeker Al Rasi and Abu Ali Ebn Sina, with sufficient precision to establish its identity with the disease of modern times. I shall merely refer to the descriptions of two of these authors.

The description of Serapion, who flourished, according to Friend, about the 890th year of the Christian era, though prolix, and occasionally confused, presents, however, all the essential characters of the disease. He remarks its insidious mode of attack, its incipient mildness, and its sudden deterioration. He remarks the burning irritation of the stomach and bowels, the ejection first of food, and the contents of the alimentary canal, then, *sequuntur eaeversiones aquosæ, puræ, et cholericæ*, with restlessness, anxiety, and nausea. The person of the patient is then shrunk, and he voids fluid like water in which flesh has been washed, with a mawkish sour smell, the pulse becomes weak, the temples collapse (*submerguntur tempora*;) the nose shrinks, and becomes cold, the countenance loses its natural complexion, and assumes the image of death, (*permutatur pulchritudo faciei totius ad dispositionem mortis*;) the feet become cold, the patient is covered with cold sweat, then cramps attack the hands and feet, and, unless the physician is prompt and undismayed, death speedily ensues.*

Abu Ali Ebn Abdalla Ebn Sina, better known to Europeans under the corruption of Avicenna, gives in the 16th *Fen* of the third book of his Canon or Encyclopedia of Medicine, a full de-

* Practica Joan. Serapion, dict Breviarium Tract. iii. cap. xix. Imp. Venetiis, 1497.

scription of the phenomena and treatment of the *passio cholericæ*, in which he remarks, like Serapion and others, its very mild commencement, and its rapid and speedy malignant aspect afterwards. The enumeration of symptoms is so clear and short that it may be added without impropriety in the words of the Latin translation.

“ Incipit ergo cum fluxu ventris cholericæ, deinde aquoso, puro, fatido ; deinde quandoque perducit ad fluxum ventris, qui est sicut *lotura carnis recentis*, habentem odorem *pinguedinis*, —et ad *curathium* ; deinde perducit ad mollificationem pulsûs, et spasmus, sudorem frigidum, et ad mortem.”

Here we remark the occasional occurrence of the discharge like washings of meat, while the *odor pinguedinis* is evidently the peculiar mawkish faint smell emitted by choleric discharges ; while the other discharge to which it leads,—*curathius*, is a barbarous or Arabic term, corresponding to mucilage, and manifestly the same as the rice-water or gruelly evacuation. *Mollificatio*, I must add, is the term invariably used by the Arabian physicians to denote extreme weakness and failure of the pulse.

In another passage in the same *Fen*, in which he impresses on the physician the necessity of attending to the discharges, he imagines that chyle, or something similar to it, is evacuated, and admonishes him that either this or the mucilaginous evacuation is pregnant with great danger, because they enfeeble the system and extinguish the pulse.

“ Dum enim perseverat exeundo chylus et aliquod homogeneum ei, et cibus, non conceditur ejus retentio omnino aliquo modo. In ipso enim est magnus timor. Et similiter quum illud quod egreditur est res *curathi* (mucilago) viscosa, aut cholericæ, aut alia ex iis quæ debilitant corpus, et imprimunt in pulsu, et faciunt eum frequentem, læsum secundum æqualitatem, et descendentem ; et faciunt apparere in corpore sicut extenuationem ; et in mirach (abdomine) sicut spasmus.” *

Though the language cannot here be recommended for its elegance, the essential circumstances are nevertheless specified with sufficient clearness and precision to show that Avicenna had in view the mortal disease of the East.

It is almost superfluous to refer to the European physicians of the Arabian school, who in general had too little learning or originality to do more than copy in the most servile manner the instructions of their preceptors. John of Gaddesden, the first English court physician in the reign of Edward II. and professor at Merton College, Oxford, in the early part of the fourteenth century, gives but a confused account of the dis-

* Lib. iii. Fen. xvi. Tract ii. p. 817.

orders of the alimentary tube, confounding the symptoms of diarrhœa, dysentery, and cholera all together. I find, however, that he gives the following prognostics. “*Omnis fluxus ventris qui primo est sicut aquæ et postea sicut unguentum est malus.*”—“*Omnis fluxus cum pulsu vermiculoso sicut formicante, qui non confortatur per cibos assumptos et medecinas est mortalis.*”—“*Item, omnis fluxus cum vomitu et singultu et alienatione est mortalis.*”—“*Item omnis fluxus stomachi et intestinorum cum nausea et vomitu malus.*” *

The physicians who wrote after the revival of literature were in general too servile copyists of the ancients, especially Hippocrates and Galen, to be capable of giving any proofs of much originality or accuracy of observation; and this character applies with considerable accuracy to Jacques Dubois, commonly called *Sylvius*, Fernel, Jason Pratensis, Lange, Duret, Houillier, Valet, Heurnius, and the whole of that laborious but injudicious class of authors who substituted vindications of the descriptions, and commentaries on the opinions, of the Greek physicians for the accurate record of natural appearances. Many of the misconceptions prevalent on this point are indeed to be traced to imperfect knowledge of the writings of the ancients, to inattention to what had been said by Cœlius Aurelianus, and Alexander of Tralles, and to the idle fancy of tracing the disease to its supposed etymology. Few instances can be adduced in the history of medicine of the pernicious influence of a name more remarkable than what this affords. From this character even Prosper Alpinus, the head of the methodic sect in modern times, is not exempt.

Yet even among some of these authors, we recognise faint but evident traces of more independent and original views. Thus even Houillier, who flourished at Paris in the middle of the sixteenth century (1562), we find represents cholera to be a most acute disease, which, without fever, in a single day, or two days, or at most the fourth, carries off the patient by effusing the whole substance of the body by incessant vomiting and purging of fluid, which proceeds sometimes from the whole body, sometimes from certain parts, as the liver. The most peculiar symptoms are spasms of the muscles and calves of the legs, which are vulgarly called *gouttes crampes*, as happened, he adds, to the widow of the deceased President *de Longueil* and Madame *Diyvor*. † Mercurialis also, who has collected the symptoms given by Hippocrates, Arctæus, Cœlius Aurelianus, and Celsus, after stating that it is a most violent and rapid disease, assigns as a reason that it combines in itself a number of

* Rosa Anglica practica medecinæ a capite ad pedes, Papiæ, 1492, De passionibus intestinorum, fol. 72.

† Hollerii Opera Om. Practica, fol. Paris, 1664.

other maladies which affect the stomach and intestines, as hiccup, vomiting, diarrhœa, dysentery, and general convulsions.*

The description given by Nicolaus Le Poix, or *Piso*, physician to the Duke of Lorraine at Naz, in the dukedom of Barr, (born in 1527, published his treatise in 1580,) shows, that while he had studied the accounts of the ancients he must have seen personally a disease altogether similar to the cholera of modern times. After stating that the discharge proceeds from the whole body, or from certain parts, as the liver, the spleen, the mesentery, and the head even, accompanied with contractions in the muscles and calves of the legs, “*quas contractiones vulgo crampas appellant,*” he states, that not even is bile discharged upwards and downwards, but first the dejection is like water, then as if recent meat had been washed in it, sometimes white, sometimes black, or various,—(*nedum bilis supra infraque erumpit, sed primum, aquæ similis dejectio est, deinde ut in ea recens caro lota esse videatur, interdum alba, nonnunquam nigra vel varia,*) which he afterwards explains by the terms *strigmenta et intestinorum rasuræ*, which are the shreds, flakes, and filaments of the orientals. Then follow thirst, faintness, cold sweats, quick, frequent, small, and interrupted pulse,—a class of symptoms to which he applies the name of collapse, (*corpus collabi.*) In short, it is a disease “*ferox, acerrimus, qui vel uno die vel altero vel certe paucis diebus, hominem rapit, substantiâ corporis effusâ partim assiduis vomitionibus partim iisdem dejectionibus.*” †

A view of cholera very similar, is given by Francis Sanchez, a native of Bragues, in Portugal, and afterwards Professor of the Practice of Physic in the University of Toulouse, and physician to the hospital of that city for thirty years, or between 1602 and 1632, when he died. In his works published in 1634 at Toulouse by his sons, we find cholera defined as a violent disturbance of the stomach, which rejects every thing upwards and downwards, without mention of bilious discharges,—as a most acute and dangerous disease, fatal often in a single day, sometimes on the second,—resulting from a great abundance of corrupted fluids collecting from every part of the body to the stomach and bowels, exciting the system to their expulsion, and accompanied with fever, frequent faintings, cold sweats, anxiety, and mental depression, painful eructations, thirst, pain of the stomach, creeping pulse, and at last convulsions. ‡

Daniel Sennert of Breslau, professor in the small University

* Hieronymi Mercurialis Foroliviensis Praelectiones de affectibus infimi Ventris, lib. iii. cap. xv.

† Nicolai Pisonis Med. Lotharingi De Cognoscendis et curandis morbis, lib. iii. cap. xiii.

‡ Francisci Sanchez, Op. Med. Telosæ Tectosagum, lib. iii. cap. vii. p. 108.

of Witteberg from 1602 till 1637, the period of his death, defines cholera to be an incessant and excessive discharge of depraved fluid (*humoris pravi rejectio per superiora et inferiora*) from stomach and bowels. This fluid, which he states is not always bile, but varies, and may be either chyle, food, or a different fluid secreted by the stomach and intestines when under the irritation of indigestible animal or vegetable food, he represents to proceed either from the mesenteric veins, or the spleen, or even if bilious from the liver. In other instances, however, in which the discharge is enormous, he admits, that it has with reason been supposed to proceed from the mesentery and the neighbouring parts, or even to be collected from the whole system; and, in proof of the possibility of this, adduces the instances of antimony and other medicines of similar qualities. He subsequently adds, that the discharge may be generated “*vel in ventriculo, vel ex hepate, liene, mesenterio, vel ex toto corpore ac venoso genere in ventriculum ac ventrem confluit.*” Is it requisite to advert to the accuracy of the views here given regarding the source of the choleric fluid in these cases of excessive discharge? Is it requisite to direct the attention of the reader to the fact, that, by the mesentery, Sennert evidently understands the blood-vessels sent between the folds of that membrane to the intestinal tube; and that, when he speaks of the fluid being collected from the whole venous system, he manifestly regarded the choleric fluid as an excessive morbid secretion from the blood-vessels? That he did not connect this excessive evacuation with any other disease is manifest, from his impressing on the reader the fact, that it is a most acute and dangerous disorder, which, if not promptly checked, is followed by frequency, smallness, and disappearance of the pulse, coldness of the extremities, fainting and convulsions.*

The chronological order would lead me next to the testimony of a Portuguese physician, but I am induced to advert to that of the professor of Montpellier for two reasons; *first*, because he appears to have copied Sennert rather too closely without acknowledgment; and, *secondly*, because, though he is very anxious to prove the existence of bilious discharges, every fact and argument which he adduces goes to contradict this assertion which he labours to uphold.

It is indeed a remarkable example of the influence of authority and the sound of a name over truth and nature, that though Alexander Trallian had, in the sixth century, pointed out the fact, that the discharges in cholera were not always bilious, but often serous and fortuitous or albuminous, yet Lazare La Riviere, Professor of the Practice of Physic in the University of Montpellier from 1621 to 1656, tells us this etymology is

* Danielis Sennerti Vratislaviensis, Op. Tome iii.

not to be approved of, not because it is wrong, but because the original etymology is the one received by Hippocrates, Galen, Celsus, and Cœlius Aurelianus; and although, says he, the fluid rejected is not always bilious, yet it is sharp, pungent, and corrupted, approaching to bile. He is, however, very much puzzled to explain the source of the extraordinary quantity of fluid which is discharged by vomiting and purging in cholera; admits that the mesentery, that is, the mesenteric vessels and the neighbouring parts, are by no means sufficient, but that it must sometimes proceed from the whole frame; and further maintains, that there is reason to believe that there is a specific irritation in the stomach and neighbouring parts, which impels the fluids to these organs.*

It is further an important observation made by this author, and which has been repeatedly verified both in India and in Europe recently, that though the vomiting and purging are checked by remedies, and the strength is restored, and the patients seem rescued from danger, not only spectators, but even physicians, may be deceived by this insidious calm. The symptoms after a single day or two at most of intermission, return with great severity and violence, and immediately destroy the patient, already enfeebled by the previous attack.

La Riviere appears further to have been led, after the example of Sennert, to infer the origin of certain forms of cholera in the vascular system, for he remarks, *si vero in venis materia sit genita, febris ut plurimum maligna adest*; and he afterwards remarks, in speaking of these malignant cases, that it is indispensable among other remedies to have recourse to venesection, which may divert, (*revellit*,) and mostly restrain that roasting and boiling blood, if the strength appears by no means enfeebled, but rather renovated by the first evacuation.†

These facts would, in my estimation, be perfectly adequate to demonstrate the proposition, that the European physicians of the sixteenth and seventeenth centuries, were quite familiar with the phenomena characteristic of exquisite or genuine cholera as a disease occurring in European countries, and occasionally, if not seasonably opposed, rapidly proceeding to the fatal termination. About this period, however, that is, about the end of the sixteenth century, when the Portuguese and other European nations were beginning, in consequence of the discovery of the route to the East Indies by the Cape of Good Hope, to increase their intercourse with these countries, information began to reach Europe of the endemial prevalence of a form of the disease still more certainly fatal, and more generally rapid in these otherwise desirable regions.

It is possible that careful research in the writings of the early

* Pract. Med. lib. ix. cap. ix.

† Ibid.

Portuguese voyagers might trace the knowledge of this fact a few years higher; but the earliest period at which I find the disease mentioned as a very fatal disorder, under its native denomination of *Mordexiin* refers to the year 1584, when John Hugh Van Linschoten, a native of Enckhuysen, in Holland, who had, in 1583, visited the East or *Portingale* Indies, as India was then named, in his account of the weather and climate of Goa, mentions it in the following terms. “The sicknesses and diseases at Goa and throughout India, which are common, come most with the changing of the times and the weather, as it is said before. There raigneth a sicknesse called *Mordexiin*, which stealeth upon men, and handleth them in such sort, that it weakeneth a man, and maketh him cast out all that he hath in his body, and many times his life withall. This sickness is very common, and killeth many a man, whereof they hardly or never escape.” *

Jacob Bontius, a Dutch physician, who resided for some years in Batavia, next recognized the peculiar virulence and fatality of cholera in the east. In a small work on the diseases of these countries, published in 1629, though he overlooks the character of the discharges, he admits the frequency, the rapidity, and the extreme mortality of the disorder. Those attacked die within the space of twenty-four hours, he states, or less; and he specifies the case of the steward of the hospital, who was attacked at six in the evening, and expired, with the most dreadful spasms, before twelve, a space within six hours. He mentions the weakness and failure of the pulse, the anxious respiration, the cold extremities and surface, with sweats, with the internal heat and thirst, and jactitation; and adds, *cholericici ut fere semper convulsi moriuntur.* †

A few years after this date, Abraham Zacutus, a Portuguese physician, more generally known, therefore, by the cognomen of *Lusitanus*, but who afterwards migrated to Holland, and settled at Amsterdam, distinguishes the Indian or Asiatic disease as more virulent in degree than the European, and mentions it under its proper Indian name of *Mordexi*.

After enumerating the usual symptoms, and observing that the discharges are not uniform, but bilious, watery, fetid, or greenish, and stating that if not excessive, and without fever, the disease is void of danger, he adds, that if the patient is attacked by fever and other serious symptoms, it is very alarming. “*Ob sui enim malignitatem et vacuationem immodicam, vires citissime*

* John Hughem Van Linschoten, his Discourse of Voyages into the East and West Indies, London, 1598, fol. The Firste Booke, chap. 34, p. 67.

† Jacobi Bontii de Medicina Indorum, cap. vi. p. 69.

resolvuntur, et magis ac magis concitata subversione ventriculi et vomitu, ægri apparent facie Hippocratica insigni exsanguis, et ad mortis fauces deducti.”

This author, in two different parts of his works, describes the disease with symptoms so characteristic and intense, as to resemble very closely the Indian variety of the disease. He represents the discharges from the stomach and bowels to consist of watery and ichorous fluids, so profuse and abundant, as to carry off the spirits, and exhaust irreparably the strength of the patient, who is then attacked with convulsion, rigidity, and spasms, loss of voice, disappearance of the pulse, coldness of the extremities and surface, anxiety, restlessness, intense thirst, and anguish, while the hippocratic countenance, and total loss of power, give him the image of death.*

In illustration of these principles he details two cases, which certainly cannot, unless in the circumstance of their recovering, be distinguished from the virulent cases of oriental cholera.

The first occurred in the person of an officer, the governor of a fort at Lisbon, who, after spending the night in the open air, enfeebled and sleepless, eat an immense quantity of unripe fruit with fried eggs, and drank afterwards very cold water. Scarcely had he gone to sleep when he was awakened with retching and griping pains in the hypogastric region, and vomited so alarmingly, and discharged such a prodigious quantity of watery fluid from the bowels, with a wavering obscure intermitting pulse, anxiety, fainting, and convulsions of the legs, that within two days he is said to have had 300 alvine discharges, and 600 vomitings; the countenance was pale and bloodless, the respiration was interrupted, the voice gone, and the pulse had almost disappeared.

This patient, however, by a farrago of stimulants and astringents, of which the most important were port wine, alum, and opium, recovered in the course of three days.

The second case specified by Zacutus, occurred in the person of an old woman of 70, of slender and emaciated figure, who, after a surfeit of melons during the dog-days, was immediately attacked by vomiting and purging so violent, that in three days during which she vomited 100 times mucous and fetid fluids, and discharged almost 300 times by the rectum ichorous fluids, and a liquid white phlegm, (*pituitam liquidam, albam,*) void of acrimony or insipid, she seemed almost lifeless. With unquenchable thirst, hiccup, obstinate sleeplessness, delirium, dry tongue, and loathing of all kinds of food, the pulse was intermitting, wavering, and sometimes entirely extinct; the voice was gone;

* Zacuti Lusitani Praxis Historica, lib. v. vel ult. Num. vii. and De Praxi Med. Administ. lib. i. obs. xvi.

the extremities were cold; the limbs occasionally convulsed; the urine was suppressed; the heart had only a tremulous motion; and the patient was in a state of continued faintness, (*leipothymia*.)

By the use of astringent injections, however, stimulant drinks and soups, medlar syrup, and chalybeate milk, this case entirely recovered.*

From such cases as these, therefore, Zacutus recommends the physician not to despise this disorder, which, fatal to few, he adds, in Portugal and Amsterdam, yet, in the east, where it is denominated in the native language *Mordexi*, immediately destroys the majority of those attacked; and in Mauritania and Arabia he represents it to be equally mortal. To this disorder, indeed, he represents the Arabians to be particularly liable, by reason of their habitually eating a cold pudding or dumpling, (*fercula*) consisting of sliced bread and an oily substance named vernacularly *cuscus*; and as this mass is raw and scarcely baked, it is digested with great difficulty, and swelling the stomach is liable to induce cholera.†

It is almost superfluous to remark, that the use of *cooscoos* has been observed among many of the Moorish and Arab races by modern travellers.

Zacutus further mentions that a colic spread epidemically over all Europe in 1600, and destroyed the majority attacked within four days. Was this simple colic or cholera?

If it seem singular that these accounts, and particularly those of Abraham Zacutus, did not correct the oft-repeated erroneous statement, that the choleric discharges were bilious, it will appear perfectly extraordinary that any one could maintain this assertion in opposition to the accurate, specific, and satisfactory description given by Herman Vander Heyden, a Flemish physician, before the middle of the seventeenth century. This author, who was public physician of the town of Ghent, published in the year 1643, in a small treatise in 4to, a discourse or advice to the public on painful loosenesses, *Trousse-galant*, or *cholera morbus*, plague, and agues, in which he gives, with a good deal of the fanciful theory of the day, by far the best and most original description of cholera,—so original indeed, that he shows at once that his description was not copied from authors, but collected from observation. The value of this document, which has been utterly overlooked by all authors, is so great, that, with the exception of the old French in which it is composed, I shall give his description nearly in his own words.

“As the names of diseases, in order to avoid misapprehen-

* Zacuti Lusitani, Obs. xvi. p. 44, De Praxi Med. Admin.

† Zacuti Lusitani Praxi Histor. lib. v. Num. vii.

sion, ought to agree with their definition, and yet authors, though the disease considered in this discourse has been by all antiquity denominatcd *cholera morbus*, have not wished to change its name ;—and as, notwithstanding, I observe that different opinions and descriptions of it are given ;—I must say first of all, that I do not believe this name to have been given it, because the great disorder and violence of the evacuation is caused by excess of acrimony, or the quantity of choleric or bilious fluid. For, although among other definitions, it is said to consist in an immoderate expulsion of choleric or bilious fluid, I cannot adopt this opinion, because neither do these yellow discharges appear as in bilious diarrhœa; but they are generally crude, and rather of a phlegmatic (serous) colour, and at last as white as pure milk (*à la fin si blanches que du clair lait*;) nor is it most frequently accompanied with fever, or any symptom indicating excess of heat or acrimony, excepting pains of the belly and thirst, which always are to be ascribed to great evacuations. I therefore am of opinion, that this disease deserves rather the names of *Trousse-galant* and *felon*, which signify pack up your last baggage; for it is a most dangerous, rapid, and felonious disorder; and I believe that the excessive discharge and violent agitation by this peccant fluid ought to be ascribed to its malignant quality.”

Vander Heyden then involves himself in some little confusion, by reasoning about malignity, sympathies, and antipathies, and occult qualities, but at length recovers himself, and says that *Trousse-galant*, or *Cholera*, which he defines parenthetically to be an evacuation or rather expulsion immoderately great, by incessant vomiting and purging, is caused by nothing else but a malignant quality of the food and drink, the fluids and serosities, particularly the bile; and to distinguish it from diarrhœa, he adds the following remarks.

“ The furious evacuation in *trousse-galant* is very dangerous, and carries off in a short time so much of the substance and strength of the body, and effects so much injury and change, that sometimes in less than seven hours, attendants will not treat a patient in it as master or relative, if they did not know him to be such, since they witness a genuine Hippocratic countenance, which signifies perfect extenuation and the image of death. This I can say I have seen among other cases in a patient of this description, whom, though I was called only to him five hours after the first attack of this felonious disease, I found overwhelmed with every symptom indicating an absolutely fatal prognostication, viz. without any pulse and speech; with the evacuations consisting of a liquor like clear milk, (*une liqueur semblable au clair lait*,) which indicated dissolution of nature to be there; the eyes so sunk in the orbits, that they could

scarcely be seen ; the arms and legs so retracted by convulsion, and so stiff, that no motion was observed, and so cold with the permanent moisture of a cold clammy sweat, that on seeing and touching the patient, he might be judged to be rather dead than alive. From this ominous state, however, he adds, against all expectation of convalescence, by means of a particular pill, consisting chiefly of opium, hyoscyamus, mummy, red coral, amber, saffron, and hartshorn, by the grace of God he perfectly recovered."

I must add, however, that if any person had seen the patient in the state now described, he would have at once, and without hesitation, have pronounced him to be in the stage of collapse of malignant Asiatic cholera. From the testimony of Vander Heyden, cases of cholera of the kind now described were at that time not uncommon in Ghent, and in many places near the Flemish Polders.*

The next person by whom the disease is mentioned under its oriental denomination is John Albert de Mandelsloe, a native of Mecklenburg, in Lower Saxony, who, by permission of the Duke of Holstein, travelled in the suite of an embassy sent to Persia by that prince, and afterwards travelled chiefly under the protection of the English government of the East Indies. Mandelsloe merely says, in speaking of the effect of the winds in blowing across the Balaghaut mountains and the shifting of the monsoons, that "the sudden change of the season, as well as constant variation of the winds, prove the occasion of many distempers, especially that called *Mordexin*, which kills without delay."† Mandelsloe travelled from Ispahan in 1638 to Surat, which he quitted on the 1st January 1639; and he arrived in London on the 28th December and in Gottorp on the 1st of May 1640.

The next authority by whom cholera, as a disease of hot climates, is mentioned, is William Le Poix, latinized *Piso*, who published at Amsterdam in 1648, a work on the physical, natural, medical, zoological, botanical, and toxicological, History of Brazil, distributed into five books. His account of the disease is short, desultory, and imperfect. That he describes, however, the genuine disease, is manifest from several of the leading symptoms which he enumerates, and in which, he says, the patients "cum subita quadam spirituum effusione ac leipothymia ex tetris et fuliginosis vaporibus orta; adeo ut, si ante

* Discours et advis sur les flus de ventre douloureux, sur le Trousse Galant, dict Cholera Morbus, La Peste, &c. Composée par M. Hermann Vander Heyden, Medecin Pensionnaire de la ville de Gand. A. Gand, 1643, 4to.

† The Voyages and Observations of John Albert de Mandelsloe, et apud Harris's Collection, Vol. i. p. 776. London, 1744. 2 vols. folio.

viginti quatuor horas non evadunt, succumbant.” This, he adds, may be anticipated, if the pulse becomes feeble, the respiration interrupted,—if the members become cold and sweat, while there is extreme burning of the internal parts round the heart, and convulsions.*

Piso says nothing of the native denomination of this disorder, an omission which is supplied by the next two authorities I shall mention.

The first of these is M. de Thevenot, who travelled through the greater part of the Indian peninsula, and even penetrated into several of the northern provinces, between January 1666 and February 1667, when he was on his return to France; but De Thevenot died at Miana, thirty leagues from Tabriz, on the 8th November the same year, so that his Indian travels were published posthumously. In these he states, that the Portuguese apply the name *Mordechin* to four sorts of colic very frequent in India,—the first, simple colic with acute pain; the second, looseness with pain; the third, violent vomiting with pain; the fourth combining all three symptoms, viz. vomiting, looseness, and extreme pain; and the last, he adds, “I take to be the *Cholera Morbus*.” Like all other authors, ancient and modern, he ascribes these attacks to indigestion; but mentions, that they cause pain so intense, as to kill the individual in twenty-four hours. He further remarks, that the Indian remedy for the disease is to apply to the heel of the patient a peg of iron, half as thick as the finger, red hot, so as to cauterize, and that this applied to both heels is very generally successful.†

The next author is M. Dellon, a physician, who, in 1668, went to the East Indies to gratify scientific curiosity apparently, but was obliged to quit Tellicherry in 1671, in consequence of incurring the suspicion of the Portuguese religious establishments. He therefore embarked at Goa in January 1676 for Europe, by the way of Brazil and Portugal, and finally arrived in France in August 1677. In his work, which was published at Paris in 1688, and at Amsterdam in 1699, he informs us, that the disease which the Orientals call *Mordechi*, though only an attack of indigestion,—is frequent in India in consequence of the stomach being enfeebled by heat and sweating, is nevertheless dangerous, and persons attacked often die in a few hours, if not speedily relieved. Like De Thevenot, he mentions the red hot iron as the most effectual remedy for those attacked by the *mordechi*; but states, that the method is to thrust the iron, which he describes as a skewer, through the hardest part of the heel

* Gualelmi Pisonis De Indiæ Utriusque re Naturali et Medica, lib. ii. cap. xi.

† The Travels of M. de Thevenot, Third Part, containing the relations of Hindoostan, the New Moguls, and of other people and countries of the Indies now made English. London, 1687.

till the patient screams with pain, and then removing the caustery, to give a few smart blows with a slipper. At first, he says, he ridiculed this whimsical remedy; but experience, he adds, is in support of its utility, and he states that he repeatedly found it successful.* Dellon was too credulous.

The evidence adduced from the writings of Zacutus Lusitanus and Vander Heyden, regarding the serous, watery and milky character of the discharges in cholera, ought to be perfectly sufficient to determine the point as to the identity of the Asiatic and European forms of the disease, and to show, that the difference is one in degree only and not in kind. It is singular that this character had escaped the observation of Sydenham, who has in other respects given an account of cholera in general correct. It may demonstrate, however, the advantage of particular observations over general descriptions, to say, that, in compensation for this defect, Morton, whose habits of observing and describing disease are unrivalled in accuracy and fidelity, has recorded one of the most striking examples of intense virulent cholera, with blueness of the surface, serous and milky discharge from the intestinal tube, and all the symptoms of the most irrecoverable collapse that ever was seen on the banks of the Ganges; and all this in the immediate vicinity of the city of London. The case to which I allude is recorded by Morton as an example of ague assuming the choleric symptoms, and, in short, presenting the true choleric character.

It occurred in 1690, in the person of a meagre valetudinarian of 50, residing in Mile End, who, in consequence of getting wet in the rain, while on the Thames rather long, was, on returning home, suddenly attacked with intense cold shivering, followed by universal chill, during which the pulse could scarcely be felt; and then by vomiting, purging, extreme oppression at the region of the stomach, and sickness exactly similar to *Cholera*. An apothecary who was summoned, by covering him abundantly with bed-clothes, and administering cordial boluses and juleps, endeavoured during the whole night to revive the almost extinguished spark, and to subdue the other alarming symptoms, but unavailingly. The following morning, when Morton saw the patient, he found the face perfectly Hippocratic and shrunk, the whole body as cold as clay, and drenched in sweat, the skin of a black tinge in many places, and the strength almost exhausted by constant sickness, and the discharge of variously coloured bile by the mouth, and of a fetid whitish cream by the anus (*evacuazione cremoris fetidi albescentis per anum.*) Every thing indicated approaching death;

* Nouvelle Relation d'un Voyage fait aux Indes Orientales, &c. par M. Dellon, Docteur en Medecine. Amsterdam, 1699.

as the vital principle, or the animal spirits, were so depressed, as Morton imagined, by some poison, that they could not be expected to be again expanded. The use of cordials and stimulants produced slight alleviation; but the patient expired within twenty-four hours from the attack.*

Morton gives a similar case, which occurred in 1676, in the person of a boy of 10, who, after labouring for three weeks under a tertian ague, was suddenly attacked by constant sickness, vomiting, and restlessness, with unquenehable thirst, a very small pulse, and general cold sweat. Purgings is not mentioned; but it might have been overlooked. The boy continued languid and cold, till the end of the third day, when he died with symptoms of irrecoverable *leipothymia*.

Cases very similar are given by Torti, and other physicians who have practised in aguish places, and with the choleric agues in tropical climates and the southern malarial regions of the temperate zone, must be held as good evidence to prove the adequacy of miasmatic or atmospherical agents in inducing cholera. It is, however, unnecessary after these to adduce further examples.

The course of my inquiry leads me to continue the chronological order; and in this I think it unnecessary to refer to the writings of Rouppe, who saw choleric attacks at the island of Curaçoa in 1760, or the work of Dr James Lind of Haslar Hospital, who, though he mentions the disease in 1768 under its proper oriental name of *Mordechin*, and distinguishes it as most rapidly fatal, gives no specific description.—I prefer proceeding at once to the distinct, full, and unequivocal description of M. Sonnerat, who, by order of the King of France, visited the East Indies and China in 1774, and spent seven years in studying the natural and civil history of these countries, and the manners of the native inhabitants.

This observer describes two forms of gastro-enteric discharges, incident, and often epidemically prevalent, in India; and both, like all authors, almost ancient and modern, he ascribes to indigestion.

The first of these is what he terms *acute flux*, and which prevailed a few years before the period of his visit extensively over the whole country, committed great ravages, and between Cheringam and Pondicherry carried off 60,000 persons. It arose from various causes. Some were attacked after sleeping during the night in the open air; others after eating cold rice with *Tair*, or curdled milk; but the majority were seized in consequence of eating after bathing or washing in cold water, which induced indigestion, he says, with universal spasm of the

* Pyretologia Exercit. I. de Protiformi Intermittentis Febris generis. cap. ix. Londini, 1692.

nervous system, followed by atony, and death, if speedy relief was not afforded. This form of disease, which was epidemic, took place while the winds blew from the north, in December, January, and February, and disappeared on their cessation. Its characters were a watery looseness, accompanied with frequent vomiting, extreme weakness, burning thirst, oppression of the breast, and suppression of the urine. Sometimes the patient suffered colicky pains; often he lost recollection and voice, or became deaf; and the pulse was small and contracted. The only specific was theriac, and what is named the bitter drug, which is a tincture of vegetable bitters made by arrack. The native physicians lost every patient.*

Two years after a more formidable epidemic of the same kind appeared. It did not proceed from the same cause as the first, as it commenced in July and August. Its first indication was a watery diarrhœa taking place all at once, and which sometimes destroyed the patient in less than twenty-four hours. Those attacked evacuated at least thirty times in five or six hours, and were reduced to such a state of weakness that they could neither speak nor move; and often the pulse disappeared entirely. The hands and ears were cold; the countenance was elongated; and a depression of the cavity of the orbits was the sign of death. Patients then felt neither pain of the belly, colic, nor griping; but suffered a burning thirst. Some voided worms by stool, others by vomiting. This relentless pestilence is stated to have smitten all Castes equally, but especially those who live on animal substances, as the *Parias*. The native physicians were equally unsuccessful as before in treating this disease, which was renewed during the prevalence of the north winds.

It is remarkable that though *Sonnerat* gives this accurate delineation of two choleric epidemics, he does not apply to either the characteristic European or Indian name. Yet it is impossible to doubt that we have here all the marks of an epidemic of the most virulent malignant cholera. He further adds, in explanation of the causes of these disorders, that the *Hindoos* are liable to serous vomitings and purgings from suppressed perspiration, the want of proper food to maintain the equipoise of the circulation, and the want of suitable clothing; and that in consequence they perish in great numbers.

It farther appears, that *Sonnerat* was unaware, that, in the delineation so faithfully given, he was describing the aggravated form of Indian cholera, since he states immediately after, that

* *Voyages aux Indes Orientales et à la Chine, &c.* Par M. *Sonnerat*, Commissaire de Marine, Tome i. p. 113, 114, Paris, 1782.

the indigestions called there by a curious corruption, *Mort de Chien*, are frequent both among the Castes which live on animal matter, and among the Bramins, who, though they use neither meat nor fish, consume much butter with their rice, and are therefore cut off suddenly. Atmospheric vicissitudes he also states are frequent causes of the disease; and many are attacked after imprudently sleeping in the open air.

Sonnerat visited India in the year 1774. Consequently both the attacks now mentioned must have occurred previous to this date, probably about 1768; and it is impossible to doubt, that, from the numbers destroyed in a few weeks on both occasions, the disease assumed the epidemic form. From the statements of Mr Jameson prefixed to the Bengal Report, it appears that the disease again appeared in an epidemic shape in 1781, first among the native inhabitants in the Northern Circars, a narrow tract, extending between Ganjam and Chicacole, along the sea coast, and then among a body of 5000 men proceeding under the command of Colonel Pearce to join the force commanded by Sir Eyre Coote, attacking more than one half, and cutting down rather more than 700. At the same time it spread to Calcutta, and cut off great numbers of the native inhabitants.

Two years after, in April 1783, it is recorded that it appeared among a great concourse of natives assembled at Hurdwar, the spot at which the sacred stream of the Ganges issues from the mountains to water the champaign country; and where multitudes spend the night in the open air, either in the very bed of the river or on its banks, with little or imperfect shelter from the chilling dews of the Indian sky. The usual religious ceremonies had scarcely commenced among these devotees when the disease broke out among them, and in less than eight days destroyed at least 20,000 persons. It immediately disappeared, however, on the cessation of the festival.

Cholera appeared a second time in the Northern Circars in the spring of 1790, among a detachment of native troops marching under Colonel Cockerell for Seringapatam.

After these facts it is almost superfluous to refer to the authority of Girdleston, who was in India in 1780, and whose statements refer chiefly to that period, or to that of Curtis, who visited India from 1781 to 1783, and whose work, published in 1807, is in every one's hands, unless to say that both authors mention the prevalence and fatality of the disease under its Indo-Portuguese denomination; and that the latter gives a most accurate account of it, in which he both remarks the absence of bilious matter, and the profuse discharge of watery fluid from the intestinal tube. He nevertheless errs in sup-

posing the native name to be French, and absurdly enough, on this view, explains it as the *death of a dog*.

From the foregoing sketch I conceive the following conclusions may be deduced.

1st, It appears that a disease distinguished by profuse and irresistible vomiting and purging of serous, sero-albuminous, or sero-sanguine fluids, and cramps of the legs and arms, followed rapidly by small or even imperceptible pulse, shrinking of the features, depression of the eyes and temples, more or less of a dingy, leaden or blue colour of the surface, with cold extremities, cold sweats, retention of urine, fainting and death, was known to Aretæus, Asclepiades, Soranus, Cœlius Aurelianus, Alexander of Tralles, and other ancient physicians.

2d, That a disease of the same character was known to several of the Arabian physicians.

3d, That, though the term *cholera* did not convey to the minds of most of the ancient physicians, the idea of bilious evacuations, the appellation has misled others of them, and especially several of the modern physicians, in making it be supposed that the characters of the disease were a discharge of bile from the stomach and intestinal tube.

4th, It appears, that, notwithstanding the influence of this mistake, several physicians of the latter half of the 16th and the early half of the 17th centuries, as Houillier, Le Poix, Sanchez, Sennert, and Abraham Zacutus *Lusitanus*, had sufficient originality and independence to disregard the definition derived from the current etymology, and to assert, according to their own observation, that the fluids discharged were watery or serous, and proceeded not from the liver, but from the vessels of the stomach and intestines; that Zacutus *Lusitanus*, Vander Heyden, and Morton, especially observed that the discharges were in severe cases albuminous or milky; and that all these authors had witnessed the assemblage of aggravated and exquisite symptoms denominated *collapse*.

5th, It appears that though Bontius describes the disease as more intense, more rapid in progress, and more certainly fatal in the East than in Europe, Van Lindshoten is the first voyager who mentions the disease under its Indian name, and Zacutus *Lusitanus*, to whom these peculiarities were known, is the first medical writer who in Europe mentions the distemper by its Indian or Indo-Portuguese appellation. It farther appears, that this term is afterwards currently used by Mandelsloe, De Thevenot, Dellon and others, to Girdlestone and Curtis; and that Sonnerat, in his wish to give it a French origin, had converted it into *Mort de Chien*; an error in

which he has been followed by Curtis and some other English authors.

6th, I have now to observe that the term *Mordechim*, *Mordexim*, or *Mordechin*, which has been so differently written by European authors, and so strangely corrupted by Sonnerat and Curtis, is a word of Persian origin used by the Hindoos, and adopted from them by the Portuguese. It is not found in D'Herbelot; and though adopted in the Portuguese dictionaries, no etymological explanation of it has been given. I think it cannot be doubted that it consists of the two roots مریدن to die, or death, or مرد dead, and خیم which, among its other significations, denotes the bowels, and consequently was used by the natives, as if to signify *bowel-death*. From the compound Indo-Persian term مردخیم the Portuguese must have adopted by the ear, the term *Mordexim*, pronounced as *x* always is in that language like the guttural *ch*. This derivation, which I conceive to be the just one, shows, that the name ought to be written *Mordechim*, or *Murdechim*, or, if the Portuguese form be adopted, *Murdexim*. It is superfluous to remark, how expressive the name is of the character of the malady.

7th, It is a historical fact established by the clearest evidence, that epidemics are mentioned by Sonnerat previous to 1774, and that subsequently, we have evidence of sudden outbreaks attacking large and multitudinous bodies of human beings, in 1780, 1781, and 1790. More early mention of epidemics might, no doubt, be found in the native records.

II. and III.—When cholera made its first appearance in this country, at Sunderland in September 1831, it was by many believed to have been imported by vessels from the Baltic; and several endeavours were made to trace the particular vessels by which the disease was introduced. This idea the two cases given by Dr Hazlewood and Mr Mordey, as occurring at Southwick and Pallion, on the 5th and 9th of August, were sufficient to render excessively doubtful, if not to overthrow entirely. A similar case, occurring in Newton, on the 6th January 1833, under the care of Mr Steele, is given in the work of Mr G. H. Bell. The most conclusive of all I conceive is the following, which took place in July in Newbigging, a small district or suburb of Musselburgh.

Robert Reid, aged 51, a potter, and exposed in consequence of working at the kiln, to great and sudden vicissitudes of heat and cold, was attacked, on Monday the 11th July 1831, with

diarrhœa in the evening, for which he took some sulphur; and the diarrhœa, after continuing the greater part of Tuesday the 12th, stopped apparently spontaneously. On Wednesday he attended at Lasswade the funeral of a child, so that he must have been considerably better. On Thursday his duty led him to draw a kiln, as it is technically named; and in this operation he was much overheated. He was soon after attacked with sickness and vomiting, followed by cramps, and profuse loose discharges from the bowels, which continued the whole of the night. These discharges were gruelly and watery from the stomach, and like dirty soap water or dirty milk from the bowels; and they literally poured from him so as to pass through the bed beneath him, and wet the floor beneath the bed as if water had been spilt on it, and were entirely void of feculent smell. These symptoms were accompanied with painful cramps, first in the toes, then in the arms, then in the calves and thighs. On the morning of Friday the 15th a little after 7, he was visited by Dr Stephen, who found him with contracted features, eyes sunk in the orbits, the lips pale, the voice almost inaudible, the surface and extremities cold, the hands cold and incurvated, the skin clammy, the muscles of the thigh cramped in the form of hard rigid lumps, and the pulse not to be felt at the wrist. The thebaic pills relieved some of the sickness; and the application of warmth with the use of brandy, produced a temporary alleviation, with return of heat. But he continued much in the same state, with weak almost extinct voice, and coldness of the extremities and surface, except at the epigastrium, and died on Monday the 18th, about 9 in the morning.

Three remarkable circumstances deserve notice in this case. 1. It occurred in the person of a man who was living on the very place where six months after some of the fatal, and several severe, cases took place. 2. It began in the form of diarrhoea at first, and was mild, and underwent a temporary suspension, apparently independently of remedies. 3. It was believed to be at first a case of ordinary cholera, incident to the season; but Dr Stephen, when he afterwards saw and treated the cases of malignant epidemic cholera, admitted that the symptoms on the morning of Friday were in all respects similar to those of the epidemic distemper which in January and February 1832 committed such ravages in this neighbourhood.

No other similar case, however, had been observed to occur in this vicinity till the night of Monday the 16th January 1832. On Tuesday morning, 17th, Mr Sibbald was called to a Mrs Wilkie, aged 60, living in a close or lane, on the south-east bank of the Esk, nearly opposite the wooden bridge called Cairncross's Bounds. She had been attacked on Monday evening

by the account, with purging and vomiting of watery fluid, continuing during the night; and on the following morning, when seen by Mr Sibbald, the countenance was dingy or leaden coloured, the eyes sunk, the voice whispering, the pulse scarcely to be felt, and the extremities cold and covered with clammy moisture. In this state she continued till Wednesday night, when she died. Some attempt was made to trace the case of this woman to the person of a soldier, who was said to have been in Haddington, where the disease was still lingering, and who, though never himself having had the disease, was stated, by visiting the house of Mrs Wilkie, to have thereby been capable of communicating its productive principle. Mr Sibbald, however, as well as Dr Stephen, assured me that no such person had been in the house of Mrs Wilkie, and that it was impossible to discover that she had been in communication with any person previously affected by cholera. In the subsequent course of the disease, the same locality, which is very low, damp, and not particularly cleanly, furnished many cases of the disease.

It was generally believed that no other case occurred till the morning of Thursday the 19th, when that of Charles Webster, in Robertson's Close, took place. This statement is in the main correct, and I shall advert to the case of Webster in due course. I must remark, however, that when in Musselburgh on the 22d January, I saw several persons labouring under various forms of gastro-enteric disorder, for instance, diarrhoea alone, vomiting and diarrhoea, &c., who, on strict interrogation, admitted that they had on Wednesday the 18th, been labouring under bowel complaint in various degrees of severity. This was the case especially with the girl Jess Kinghorn, living in a house close by the aqueduct that runs past the hair-cloth manufactory, and with several other persons who had been working at that establishment.

In the meanwhile, however, that is, before any other marked or impressive case had occurred in Musselburgh, the disease had appeared between the night of Wednesday the 18th, and the morning of Thursday the 19th January, at Coalpits, a small village or hamlet about a mile above Musselburgh, on the east or south bank of the Esk. This place consists of about 40 houses, arranged in two rectangular lines, one parallel to the bank, the other at right angles to the course of the river. The line along the bank consists of 12 cottages; that at right angles to it consists of 27; and a single house, a little larger than the rest, is placed at the opposite corner. All consist of one story or flat only, built on the ground; all have earthen or brick floors; and all are inhabited by colliers or persons connected with the pitmen.

The first case occurred in the person of Mrs Clarkson, aged

about 36, who was attacked between two and three in the morning of Thursday 19th January with vomiting, purging, and cramps, followed by general coldness, and died the same evening between six and seven o'clock. This woman never was at Tranent or Haddington, nor any way to the east where the disease was prevailing, but had been on Monday 16th to Fishcrauw, where the disease had not yet appeared. The cottage in which she lived is one of those in the line near the Esk.

The disease next appeared in the person of Jean Galloway, *alias* Mrs Currie, aged about 50, on Thursday 19th about twelve, in the usual way; and she died that evening at ten. Mrs Currie had rubbed the previous patient; but the interval between exposure and attack appears to be instantaneous. None of her family, consisting of her husband and three children, were attacked.

On the same day, Thursday 19th, Mrs Sneddon, *æt.* 49, who had been well on Wednesday, but afterwards acknowledged she had laboured under looseness without pain for three weeks, was attacked with sickness, vomiting, and more violent purging. This, which was the third case, recovered.

Mrs Moffat, *æt.* 60, was then attacked with the usual symptoms on Friday the 20th, at two P. M., and died on Saturday morning between four and five, after 14 hours illness. This woman had visited Mrs Clarkson on Monday; but the interval also appears to be too short for the influence of a contagious poison. None of the family, consisting of three sons and two daughters, were attacked.

The fifth case occurred in the person of George Clarkson, *æt.* 48, the husband of No. 1. He had been at the funeral of his wife on the afternoon of Saturday 21st between 3 and 4; he became sick, and vomited and purged copiously the same night; all Sunday he was in a state of collapse; and he died on Monday, twenty minutes after one in the morning. This family consisted of eight persons, one son by a former marriage, one son and daughter, twins at the breast, and a servant; yet of these eight, the father and mother only were attacked and cut off.

On the evening of the same day, the sixth case occurred in the person of Elizabeth Hine, a woman of 29, unmarried. Her first symptoms were cramps, speedily followed by vomiting and purging, and the usual symptoms of collapse. She lingered, however, till the 28th, when she died between seven and eight in the evening. This woman, who was said to be stout, healthy, and vigorous, had assisted Mrs Clarkson.

On the same day, Saturday 21st, James Sneddon, *æt.* 45, collier, who had been thoroughly exposed to moisture at the Prestongrange pit, and had been labouring under bowel com-

plaints since Wednesday the 18th, was attacked with cold shivering and vomiting. The diarrhoea he states continued as white as curd and whey for two days. This appears, however, to have stopped almost spontaneously, for he took no medicine till Thursday 25th, and he recovered.

His daughter Elizabeth Sneddon, aged 16, who was attacked on Tuesday 24th at eight p. m. with sickness, vomiting, and profuse purging of clear water and slime, was less fortunate. These symptoms were speedily followed by pain of the back, general chillness, with great heat at the epigastric region, and a blue or leaden colour of the face, and blueness of the lips, and death at eight on Wednesday evening.

During the night of the same day, Tuesday 24th, Violet Inglis or Mrs Gray, a woman of 45, whose health had been degraded since the cessation of menstrual secretion, and who had suffered bowel complaint for several days before, was seized with vomiting and cramp, in addition to the bowel complaint, the discharges of which became then profuse and watery; and she died on the morning of the 25th, after twelve hours illness. This woman lived in the corner house nearest the Esk, which was clean and well aired, but with a brick floor. No other person of a family of eight was attacked.

Next day Jane Gray, a child of three, and niece to Mrs Gray, came with her mother to the funeral. The child was three hours in the house, in a room a good way apart from that in which the corpse was, and without communication with it. At the end of this time she became sick and vomited, was attacked in the course of the evening with looseness, and these symptoms having increased the following day, she died on the 27th, about eleven p. m. She was one of a family of ten, none of whom were attacked.

The last person attacked in this hamlet was Janet Wilson, æt. 35, mother of a family of six children, deserted some time before by her husband, and supported by parochial aid, who, on Sunday the 5th February, was seized with looseness, vomiting and cramps, speedily followed by chillness of the surface, and leaden coloured countenance, and death about ten a. m. on Monday the 6th.

Thus in this place of 40 houses, there were eleven cases and nine deaths. It was at first asserted that James Sneddon had brought the disease from Prestongrange pit, where it was alleged Tranent people were working; but Sneddon was not the first person attacked, and he assured me himself that no one at that pit had been affected by the disease, except himself. But even if they had, it is easy to see, that exposure to the humidity of the pit, which was one of the wettest in the neighbourhood,

was quite sufficient with the atmospheric constitution to produce the disease. All these cases, it may be observed, occurred, except the last, within a very short space of each other; and it is impossible to conceive the one communicated from the other.

I have already said that the disease had appeared on Monday the 16th at Musselburgh. On Wednesday the 18th January no new case had occurred; but early on Thursday 19th, the second decided case appeared in the person of Charles Webster, a stout healthy man of 38, living in Robertson's Close, Fishierrow, not far from the Old Bridge. This man, who had gone to bed on the night of Wednesday the 18th, quite well, with the intention of rising to dig a grave for the corpse of a relative, who had died not of cholera, but of old age, in a state of destitution, was awakened next morning at four with a bowel complaint, which was so severe and profuse that his wife attempted to dissuade him from going out to the burying ground. He persevered, nevertheless, was attacked with vomiting in the grave, returned without completing the task, with all the symptoms of the disease, and died the same evening in a state of complete collapse. Webster had no communication whatever with any person who had been at Tranent or Haddington. The locality in which he lived soon afterwards furnished seven fatal cases.

The same day, Thursday, 19th, Thomas Hilson, a young man of 17, a potter, residing in Ponton's Close, on the south side of the High Street, Musselburgh, was attacked about twelve with profuse diarrhœa, followed by vomiting, cramps, and the usual symptoms proceeding to collapse, in which state he died the following day. This was the third death; and by this time several other persons were taken ill. Thus Anne Weir, æt. 37, married, living on the south side of the High Street of Musselburgh, in Ponton's Land, was attacked on Wednesday night with pain in the bowels, and vomiting followed by diarrhœa, and was proceeding to collapse, when she was seen by Mr Moir. She was better on Saturday the 21st, and made a slow but pretty good recovery. In the same locality with Hilson, Mrs Jardine, aged 45, was attacked on Thursday, and died on Friday; and a day or two after, Ann Moody was attacked and died.

In Cairncross's Bounds, where the first case occurred, several more immediately followed. On Thursday afternoon, 19th, at five, Mrs Black was sufficiently well to look at the funeral of Mrs Wilkie; yet was attacked that night, and was lifeless before twenty-four hours had elapsed. A woman named Shivers, and another named Chestnut, were then attacked but recovered; and Chestnut's husband had symptoms.

In the meantime the disease was daily and hourly spreading.

On the 21st, when about twenty persons had already been cut off by it, fresh attacks were taking place every hour. Several of them indeed were mere diarrhœa or diarrhœas with slight vomiting, and perhaps would have proceeded to cholera only if neglected. But the number of persons complaining of more or less looseness of the bowels on this day was considerable. These persons were living in different parts of the town, some in Newbigging, some in Musselburgh, and one or two in Fisherrow; for in the latter place the disease had not yet appeared generally. About five or six persons, generally females, employed at the hair-cloth manufactory, had been attacked between Thursday and Saturday, chiefly with diarrhœa.

On Sunday, the 22d, the genuine choleric form of the disease appeared at Newbigging in the person of a man of 26, named Nisbett, who died next morning at three; the same day in Anne Renton, a woman of 50, who was immediately bled to the amount of eighteen ounces and recovered; and a few other cases of diarrhœa took place in the same neighbourhood. The woman attacked last had visited the man Nisbett; but she was taken ill immediately, so that the disease must have been in her person previous to the visit.

After this date the disease broke out in different parts of the town and its suburbs, all without communication with persons previously attacked; so that it was impossible to trace the course of the epidemic. It was manifestly, however, more partial to certain localities than to others. Thus it appeared on the 26th and 28th in Robertson's Close in Fisherrow, where it had already cut off Webster, and attacked and destroyed seven persons almost successively;—Mrs Beveridge, aged 45, two sons of 15 and 18, and a child of $2\frac{1}{2}$; Mrs Scott, aged 45; George Jack, aged 45, and his son, a boy of 14. It was also very prevalent in the houses situate in the closes and narrow alleys communicating with the main street, and what is termed the *back* of Fisherrow. These alleys were remarkable for the accumulation of animal matter in a state of decomposition; all the houses have earthen floors, which are constantly wet, with every species of humidity. They were also imperfectly ventilated, and in several of them, in which there was either no window except a hole in the roof for the issue of the smoke, or the window had been shut up, the air was corrupted in the extreme. In these hovels the disease was frequent, rapid, and very fatal; and I am certain that I do not exaggerate when I say, that at least 150 of the fatal cases occurred in the situation now mentioned. This, indeed, is by far the most densely peopled part of Musselburgh; and when the disease appeared it seemed to find its most ready victims in this neighbourhood.

In this part of Fisherrow, if it were wished to demonstrate communication it could easily be done ; for the inhabitants were in constant mutual intercourse. This, however, would not serve to explain the progress of the disorder among them ; for on the one hand, the attacks were often simultaneous in one locality, or after intervals so short that it was impossible to imagine the disease to be communicated by any principle capable of such rapid maturation ; and, on the other, in remote localities, where it was known that no intercourse had taken place with localities infected, the disease broke out spontaneously.

It is further remarkable, that while there were at Newbigging, which is a more elevated district, remote from the sea and the Esk, about 80 or 85 cases of diarrhœa, not above 28 of well-marked cholera and only 13 fatal cases, there were in the Fisherrow district about 180 cases of well-marked cholera. This fact may serve to illustrate the influence of low flat districts and the vicinity of masses of water, since Fisherrow may be regarded as standing on a dead level between the Esk on the east, and the sea on the north and west.

One professional gentleman who, however, had been liable to diarrhœa, and was of a sickly delicate constitution, was attacked, and cut off by the disease. Another gentleman had diarrhœa, which, however, subsided, under the use of the blue pill. None of the attendants who rubbed or nursed were taken ill except a woman, who was attacked with symptoms of continued fever.

Two persons employed in digging graves fell victims to the disease ; but, to show the weight of this evidence, it must be stated, that one man was attacked while shaving, in consequence of the dead cart passing the window with two coffins in it.

The disease appeared in one instance in a private asylum for insane persons, but did not spread beyond the individual first attacked.

The disease began to attack smaller numbers about the 20th of February ; and, after the cases had been comparatively fewer in number and milder in intensity, the last bad case of very decided collapse occurred on the 24th February, in the person of a man named William Jones, æt. 24, who was in perfect collapse on the 28th, and died that night.

The whole course of the epidemic was therefore completed in the space of about thirty-nine days ; and during this time about 400 persons had been attacked with various symptoms of gastro-enteric irritation, and about 208 had been cut off in the state, in general, of collapse. This is a degree of rapidity of progress that accords very imperfectly with the characters of a contagious disorder ; and the circumstance ought to be regarded

by those who know the characters of the introduction, diffusion, and propagation of contagious distempers, as, along with others, decisive against the idea, that it was connected with any contagious principle.

It is further very remarkable, that during the whole of this period, though the intercourse between Musselburgh and Fisherrow and Edinburgh was by no means suspended, no case occurred in the latter city which could be traced to unequivocal communication with the former places.

The first distinct case which took place in Edinburgh appears to have been in the night between the 26th and 27th January, in the person of a man named Anderson, residing in the West Bow. This man had been at Musselburgh in a house where a fatal case had taken place. The same night the disease appeared in a girl who lived in a close off the West Bow, and who is said, on recovery, to have acknowledged, that she slept in the bed of a patient who had laboured under the disease at Prestonpans. On the 28th, a case which occurred about three miles from town in a young woman who had attended her mother in Musselburgh, was brought to Queensberry House, and terminated fatally. No case after this occurred till the 9th February, when two cases occurred in Ward 19, Canon-gate. A few days afterwards it appeared in a woman of 60, whose grandson was said to have spent some days in Musselburgh or Fisherrow. The boy had no symptom himself; but, some days after he returned to Edinburgh, the grandmother was attacked, and died. But suppose that it be admitted that these were examples of the importation of the disease from infected districts, this hypothesis will not account for the subsequent cases, none of which could be traced beyond the persons originally attacked. Thus in the Hardwell Close, a very filthy, moist, and densely peopled locality in the Pleasance, cases took place early in February, without any possibility of tracing them to communication with Musselburgh; and here they continued to recur during the subsequent course of the epidemic. John Ewing, aged 50, a gardener, residing in 108, George Street, but little employed, and earning only a scanty subsistence in a garden near the Union Dairy, and who had never been out of town farther than that, was attacked on the 24th February, and died that night. A man was attacked at this time, about the 28th February, with the disease from no other ostensible cause than working to overheating at some out-door work in the neighbourhood of the damp meadow below Salisbury Craigs; and to some similar cause, as I shall show, most of the subsequent cases could be traced. David Scott, aged 35, a milk-carrier, of intemperate habits, had diar-

rhœa all Tuesday, 13th March, and after drinking a large quantity of cold water while overheated and perspiring at 5 P. M. was almost immediately after attacked by vomiting and cramps, with profuse purging. He was admitted into hospital at 6, and died next morning at 4 A. M. It must not be denied that the disease proceeded very slowly and gradually; and while, in the early part of February, there were days on which no case occurred, about the middle and latter part of the month the cases were two daily,—on two days, the 17th and 22d, three,—and on the 15th, 19th, 25th, and 26th and 29th, only one,—and on the 28th none.

From this time to the 7th March no new case appears to have taken place,—at least none was reported; and though on the 7th one case appeared, it was only on the 11th that five took place, which were all in the Water of Leith, and in which the disease had appeared without the possibility of tracing its origin, and continued to spread until about forty-nine persons had been attacked, and twenty-seven had been destroyed, by the 24th of March. The rate of attacks in this village were afterwards on the 12th, four; 13th, three; 14th, thirteen; 15th, three; 16th, seven; 17th, three; 18th, two; 20th, two; 22d, two; and after this period, for a few days, it was abated; and the 23d, 24th, and 25th, afforded no case; the 26th one; the 27th three; and the 28th, two. After this it augmented at the rate of three daily; and eventually the disease continued till the 29th April, when it became extinct as an epidemic in this village. At the same time the disease was prevailing in other localities along the course of that stream,—for instance, at Canonmills and Bonnington,—but affecting smaller numbers, by reason of the thinner population. In the Water of Leith, however, the disease again appeared on the 4th of July, and continued to prevail, though in a very limited form, till the 15th. After which this village remained healthy till the end of August, when cases began to prevail, and continued to occur at intervals, both there and at Canonmills, till the middle of November.

It is impossible, in the space to which I must restrict these observations, to advert minutely to the progress and diffusion of the disease; and I must confine myself to the notice of such prominent facts, as may convey some idea of the mode in which the disease proceeded.

The disease presented in Edinburgh three epidemic periods of prevalence,—one which I date from February to the 14th of June, the second from the 16th of June to the 29th July, and the third from the 1st of August to the 1st of December.

At the commencement of the first period the disease advanc-

ed very slowly in the months of March and April in the city of Edinburgh, at the rate of from five to ten or fifteen new cases daily; one day affording four or five new cases, and the subsequent one seven, eight, or ten. On the 22d they rose to twelve, and increased by one each of the two subsequent days,—fell again to twelve on the 25th, rose to fifteen on the 26th, fell to ten on the 27th, to seven on the 28th, and all at once, rose to twenty-six on the 29th. This was the greatest number during the first period of the epidemic. A considerable number of these cases occurred in various closes in the West Bow, Grant's Close, and Grassmarket, Cowie's Close, Burt's Close, Plainstone Close, Foulis' Close. Others, however, occurred in very different localities, for instance in Richmond Place and South Richmond Street.

On the following day, they fell to twelve; on the 1st May, there were only five, and on the 2d, they rose to seventeen; after this they did not rise above seven, till the 9th, when they were fourteen; and after the 14th, they seldom rose above two cases daily. On the 26th of May, and on the 8th, 12th, 14th and 15th of June, there were no cases; and at this time the disease appeared to undergo a temporary abatement.

It was nevertheless remarkable that at Portobello, after it had been gone for some time, and the hospital there even had been shut, it appeared suddenly and unexpectedly about the 10th, when an old woman, in easy circumstances, and living in a well-aired comfortable house, became the first victim in the course of about 20 hours. In this case it was impossible to trace any communication of a satisfactory description; and the disease appeared to arise spontaneously, or in consequence of the prevalence of cold damp east wind. The same day a young man named Marshall, mentioned in my last communication, was attacked with a severe form of the disease, proceeding rapidly to collapse, from no other apparent cause than working on the beach without his jacket, and heating himself in the face of a cold sea breeze. It must not be omitted also, that the hovel in which he lived was built on the ground with a damp earthen floor; and, above all, that the sleeping apartments of the family were in direct communication with the filth of a cow-house. It is nevertheless remarkable, that, though in both these cases the other members of the family continued in close and assiduous attendance, none of them ever had a symptom of the disease.

Many similar instances of attack and exemption occurred very much in the same way. Thus, Richard Mason, a man living in Drummond Street, was, after having overheated himself in dragging a small ear to Portobello and back to Edinburgh, attacked

on the evening of Monday 2d July at 10, and died next morning at nine. Thomas Pearson, aged 58, a labouring man, living in a foul and badly aired court in the Pleasance, had walked first to Cramond, thence to Leith, thence by the sea shore to Portobello, on Monday the 2d July, and sat down to rest himself on the way, and drank some cold water. He proceeded to Portobello, and thence to Edinburgh, where he was attacked that night with profuse vomiting and purging, rapidly followed by cramps, and then by the usual symptoms of collapse, and continued in this state till Wednesday night, when he expired. In this instance no communication whatever with any infected person could be traced.

Numberless similar examples occurred; and, in short, the instances in which the disease arose in this manner were so preponderating, that it was quite impossible to trace them to personal communication.

It undoubtedly happened that occasionally more than one member of a family were attacked. Thus a man named Murray, living in Wood's Court, West Nicolson Street, was attacked on Friday the 29th, and died on Saturday; and his wife was seized between the night of Tuesday 3d and Wednesday 4th July, and died the following day. In this case, however, both parties, it may be observed, were exposed to the same general causes of food, and mode of living; Mrs M. had been *five* days under diarrhœa; and none of the individuals who attended and nursed Mrs Murray to the last were affected by the disease.

After the temporary abatement at the middle of June, the disease began to spread more extensively again at the close of that month, and during July; and on the 26th and 30th of the former month nine cases, and on the 27th, thirteen occurred; on the 1st July, fourteen, on the 3d, sixteen, on the 4th, twenty, on the 6th, nineteen, on the 7th and 9th, eighteen, and on the 11th, fifteen; and after this date the cases began again to diminish to seven, four, six, and one daily, with the exception of the 18th and 23d, on each of which days thirteen cases occurred. On the 27th and 31st, there was only one, and on the 29th, no new case took place.

This subsidence, however, was of short duration; for though the disease did not, during the course of this month, break out very extensively or violently, there never was a day without from four to five new cases. The disease further observed the same fluctuations as in former months, that is, for one or two or even three days, there were only four, five, or six cases, but on the fourth day they might rise all at once to sixteen, or eighteen, or twenty. Thus, on the 16th, they rose to fourteen, having been only six the previous day; and though they were five and four on the 17th and 18th, respectively, there were twelve on

the 19th, and nineteen on the 20th. This was the greatest number on any single day in the month of August.

The weather, I may add, was, during the greater part of this month, dry and steady, though chill at night. The barometer varied from 29° to $29\frac{3}{4}^{\circ}$, and the greatest diurnal heat never exceeded 70° .

During September the daily numbers varied from four, which was the lowest, to twelve (5th), thirteen (16th and 25th), fourteen (1st and 18th), fifteen (15th), sixteen on the 28th, and 19th, which was the highest.

In the beginning of October, they assumed a very sudden increase, and after being twenty-two on the 1st, and twenty-three on the 2d, they rose all at once on the 3d to forty-four, and on 4th to forty-five, which was the greatest daily number observed during the whole course of the epidemic.

These cases came from all parts of the town; but the greatest number certainly came from such localities as, Castle Bank, Roxburgh's Close, Middle Meal-market Stairs, James's Street, Aird's Close, Fairley's Entry, Burt's Close, and especially Jamaica Street and the vicinity.

On the 5th, the numbers again fell to twenty-three, but rose on the 6th to thirty, were twenty-seven on the 7th, and fell to eighteen on the 8th, on the 9th to thirteen, but rose on the 10th to twenty-six, and were on the subsequent days successively nineteen, eighteen, thirteen, fifteen, and twenty-two, which was the number of the 15th; and after this they did not again rise above fourteen, which was the number of the 23d, but kept varying from four or five to ten or twelve.

In the month of November the disease began to undergo a manifest abatement in the extent of its prevalence; but the attacks continued as virulent and rapid as ever. The greatest daily number of cases in the course of this month was seven, which was the number of the 3d; and in general they varied from two to three daily, till the 10th, in which no new case was reported. Two cases, however, occurred on the 11th, two on the 12th and 14th, and one on the 13th; and the 15th, 16th, 17th, 18th, and 19th were again days of immunity. Two occurred on the 20th, 22d, and 24th; and the 21st and 23d were days of immunity. The 24th produced two cases, and the 25th, 26th, 29th, and 30th, each three. The first three days of December were days of total exemption; the 4th, 5th, 6th, 8th, and 9th, had one each; the 7th and 11th, each two, and the other days none. After this the disease ceased to exist in its epidemic form.

The total number of persons attacked was 1886.

The total number of deaths 1065.

The total recoveries 821.

Though, from the localities in which the disease prevailed, and the dates at which it was most prevalent, taken alone, not much precise information illustrative of its etiology can be obtained, I think these circumstances, combined with those of families and individuals attacked, afford elements of great importance.

It was, in the *first* place, remarkable, that, in a large proportion of cases, only one individual of a family was attacked; and not only the returns afford numerous examples of this, but the cases in the Castle-Hill Hospital might often be adduced to confirm this inference. Of 318 cases admitted, I find 291 examples of single attacks in the same family. The wife was occasionally attacked while the husband escaped; and conversely, the husband, if a drunken, irregular, or enfeebled and unhealthy person, was attacked and destroyed, and the wife escaped, and without one of the children being attacked; and, on the other hand, while a son or a daughter was attacked and cut off, not one of the family showed the smallest symptom of the disease. This shall be illustrated more fully afterwards.

In the *second* place, when two or more persons of the same family were attacked, it was in general simultaneously, or within so short an interval that it was physiologically impossible that the one should have communicated the disease to the other. The following examples will illustrate the nature of this inference.

Christian Fairbairn, a woman of 55, residing at Canonmills, was attacked on the 27th March at four in the morning, and died the same day at half-past three in the afternoon in the Castle-Hill Hospital. Her brother, who lived in the same house, locked his door that evening, and forthwith drank sixteen ounces of whisky. When the door was broken open on the morning of the 28th, this man was found in a state of complete collapse. He was admitted into the hospital at noon, and died at a quarter past one.

Charles Dickie, a boy of 5, was attacked at three P. M. of the 28th April, and died at four P. M. on the 29th. His mother, Catherine Dickie, aged 40, was attacked at four of the morning of the 29th, but recovered. A girl of 14, named Mary Dickie, was attacked at the same lodgings at three P. M. of the 28th; and a boy named Nathaniel Dickie, sent from the Police Office, had been attacked at two P. M. with choleric purging.

Isabella Johnson, 30, Brown's Court, Water of Leith, drank some sour beer on the night of March 12th, and was immediately after attacked by the disease, and died. Her daughter was attacked on the 14th.

George Cruickshanks and his wife, residing in Gosford's Close, were both attacked on the morning of the 5th July, the latter

first apparently from their own testimony, but not above two hours before the husband. A man named Macculloch, living in Brown's Close, High Street, went to bed apparently, on the night of Tuesday, 17th July, with little complaint, but was found stiff and dead in the morning by his family. The body was inspected, and presented the usual appearances of choleric subjects. One of the sons was attacked the same morning with diarrhoea, which became so profuse in the course of the day that next morning, 19th, when he was vomiting, he came immediately to the hospital, and recovered. Eliza Martin, aged 25, Post-Office Close, was attacked with cholera on the night of the 27th September; and her mother the day after presented all the usual symptoms. Margaret Sutherland, aged 11, residing in Libberton's Wynd, was attacked on the 9th October; and in the course of the same day her mother was attacked. The former recovered; the latter died.

Now it is a common character of the whole of these cases, that though they took place in individuals belonging to the same family, living under the same roof, and in constant mutual communication, yet in each the interval between the attack of the first and that of the second was too short to warrant the conclusion, that the morbid principle of the latter was derived from the former. It is impossible, according to the rules of philosophical reasoning, and the known laws of physiology, to imagine that the human body is capable of communicating a morbid poisonous principle before it has manifest symptoms of disorder. It is difficult to conceive that the human body, even at the very commencement of a train of morbid action, can have elaborated any new principle capable of reproducing the same action; and it is most natural to think that the morbid process must be fully established, before it can give birth to the material agent, which, according to the hypothesis of contagious principles, is supposed to communicate the disease. In the short space of two hours, six, eight, or even twelve hours, it is impossible to believe that a poison can be generated in the human body, emitted from it, and communicated to the frame of a healthy person, so as to produce all the morbid phenomena, which had only commenced a few hours before in the system of the individual who is supposed to have communicated the poisonous principle. All this, however, we must admit, according to the hypothesis of contagious propagation in these cases now referred to, and many similar ones. We must believe, for example, that the man Fairbairn, who was taken ill about seven or eight hours after his sister, and had been removed from their house, had already in the short space of one or two hours been infected by her. We must believe that Mrs Cruickshanks had, after two hours ill-

ness, infected her husband; and that the man Macculloch had infected his son before five in the morning of Wednesday the 17th, since the young man had gone out at six, and did not return till he found himself unwell.

These facts and arguments, which require no further commentary, I submit to the consideration of those who are acquainted with the laws by which the propagation of contagious diseases is regulated. If it be not an inevitable conclusion, I think it is by far the most probable one, that these cases depended on the operation of the same general cause, whatever that may be.

On the other hand, when more than one of a family were attacked, it sometimes happened, that a space of four, five, or six weeks intervened, so as to render it impossible to refer the second attack to infection from the first. Thus James Barr, a sickly boy of 10, living at Castle Bank, was attacked on the 7th July, and died on the 11th. Every other member of this family remained free from the disease till the 29th September,—a space of nearly twelve weeks, when a younger brother, aged 7, was, after eating some raw fruit and vegetables, attacked with the usual symptoms, but recovered.

Thirdly, In other instances, where several members of the same family were attacked, either simultaneously or successively, the occurrence of the disease could be traced to indigence, penury, and more or less destitution. This was remarkably illustrated in the case of a family named Denham, residing in Stockbridge. Adam Denham, a boy of 11, was attacked on the 27th October, and died the next day; William, a younger brother of 8, was attacked on the 28th, and after showing symptoms of amendment, expired at length on the 3d November; and Mary Denham, their sister, a girl of 13, was attacked on the 29th, and with great difficulty recovered. It was afterwards ascertained that this family, whose appearance was much above that of the usual rank of our hospital cases, had been for weeks in great penury and distress, which produced an effect so much more striking on their health, in consequence of their anxiety to conceal it; and it was only when the first boy was in the agonies of death that they consented to come to the quarantine establishment. As the three cases followed each other with such rapidity, it seems more natural to believe that they all proceeded from the same general cause, than that the one derived the disease from the other.

These facts I think of more moment in estimating the influence of contagion, than those which are derived from the disease extending to attendants and others. The latter, of which we had numerous and forcible examples, are easily explained away by the doctrine of susceptibility or insusceptibility. The fox-

mer show that what is named efficient propagation, or the formation of a disease in the frame of a person previously healthy, who has been exposed to another after a given time, cannot have place, unless there is both time for exposure and time for maturation of the alleged poisonous principle.

It is nevertheless not unnecessary to remark, that in no instance did the disease appear to be communicated to any of the attendants in the Castle-Hill Hospital; and in no instance was any one of them affected by the disease. One woman, who had been a nurse in the cholera hospital in Leith, and who was residing at Brown's Court, Leith Walk, was attacked on the 9th April, and immediately brought to the hospital, where she died on the 11th. One of our nurses, who was dismissed for drunkenness, went to the Drummond Street Hospital, where she was soon attacked, and cut off by the disease. One woman also, who was enfeebled, and had for years a bad leg, and was acting as nurse in the latter institution, was cut off by a rapid attack of cholera. But in all these cases, it may justly be presumed that these persons would have been attacked, whether they had been exposed to the disease or not. Wherever drunkenness, late hours, disease or infirmity, or much fatigue were in operation, they invariably rendered the subjects of them liable to cholera.

I will not, however, deny, that some cases took place which certainly had the appearance of communication from the sick to the sound; and, as I have no wish to suppress such examples, I shall give a few of them.

A man named Nimmo, who was in destitute circumstances, resident in Gibb's Entry, was attacked on the 13th June, and died the same day. On the 18th, his daughter and another woman, who was not resident there, but only a visitor, were attacked.

Miss H. aged 45, resident in George Street, was attacked at 5 A. M., 7th July, and died at half-past eleven the same night. Her father had diarrhœa on the 8th, yet on the 10th was able to walk in the Queen's Street Gardens, from which, however, he came home with loss of voice, and died the same evening. The woman who came two days after to wash the clothes in the house was immediately attacked.

A lady, rather past the middle period of life, residing for the time in George Square, and liable to habitual diarrhœa, was, after one of her usual attacks, on Friday 17th September, seized in the morning of the 18th with all the usual symptoms of violent cholera, which proceeded to collapse, and terminated fatally on the morning of the 19th. No other person of the same family was attacked; but the woman who acted as nurse, and who had carried off the shift of the deceased with the pious intention of communicating the disease to her husband, was

herself attacked by the disease on the 22d, and died in Drummond Street Hospital. I do not believe, however, that this woman was longer or more freely exposed to the emanation from the patient than I was myself or the servant of the house; and I have every reason to believe that the mere fatigue, the night watching, and the consequent stimulation by spirits, to which she absurdly conceived herself entitled, were sufficient to induce the disease at such a period.

Mr Taylor also informed me, that Mrs Lockhart, aged 42, was attacked on the 9th of August, and died on the morning of the 10th, Friday. Mrs Forrest, aged 28, a stout healthy woman, and her mother, Mrs Smith, attended her for two nights. On the 10th, Mrs Smith had symptoms, but recovered. On the 11th, Mrs Forrest had a bowel complaint, which went on the whole day, Saturday; she applied for Mr Taylor's assistance, at three on Sunday the 12th, and she died that night. Mr Lockhart had the disease on Sunday, the 12th. These cases, however, may be equally referred to the influence of the locality in which Mrs Smith and Mrs Forrest had spent two nights.

Mrs Borthwick, aged 35, on the 7th August, washed the clothes of a child who had died of cholera on the 4th. She was immediately after leaving washing attacked about eight that evening by the usual symptoms, and died on the morning of the 9th. This woman was very apprehensive, but did not know that the clothes she was washing were those of a choleric case. Her husband was attacked on the 15th, and died on the 17th.

To these cases, as examples of transmission of the distemper from one individual to another, I do not myself attach much importance; because I can easily see that if such a distemper can attack one individual spontaneously, or from the operation of atmospherical causes, or in consequence of gross errors of diet, nothing can prevent it from attacking others in the same manner. In short, when the disease was observed during the whole course of the epidemic, to be springing up every other day in situations the most different, and among persons who had no possible intercourse with the sick, I cannot perceive by what means it can be regarded as contagious in its origin, or that the assumption of contagion would account for its propagation. On the night of the 2d November, two cases took place in the same ward in the Royal Infirmary, in persons who had not been by any means exposed to the disease; and next day a third followed. The same night, the disease attacked a man in the Calton Jail. It was afterwards ascertained that the patients thus attacked, who were women in bad general health, had been eating raw fruit the previous night.

Had the disease been in any degree or mode contagious, it is difficult to understand by what means the medical and other attendants escaped. Mr Rae, the house-surgeon, and Mr Ferris, the apothecary, were up alternate nights during all those periods of the epidemic in which cases were numerous or severe; and the day-duty of these gentlemen was so oppressive, that more than once I found them asleep, from downright fatigue, during the day. I in general spent from seven to eight hours daily at the hospital. Beside the regular hours of visit, at ten and three, I was often there at seven in the morning, and very often between nine and eleven at night, so that if free exposure be requisite to communicate the disorder, that was not wanting. I do not think I could have done the same with impunity in a Fever Hospital.

In the exposure of professional persons, however, especially if persuaded of the non-contagious character of the disease, there is nothing wonderful. Our managers manifested in the same way a most perfect disregard to the alleged contagious character of the disease. Not only did the Lord President visit the hospital frequently, and examine patients; but our ordinary managers, Mr George Forbes and Mr Cowan, made daily visits, at which they spent a considerable time, in seeing the most hopeless cases, and often in direct communication with them. The former gentleman, indeed, during the worst period of the epidemic, visited the wards twice daily, and, by his assiduous attentions, contributed very much to the efficiency of the hospital establishment.

In short, I think, that, from the foregoing facts and arguments, it may be justly concluded, that the disease may attack any person who has been exposed to cold or humidity, either while overheated, or while enfeebled by intoxication, by disorder of the alimentary canal, or by any cause which impairs the energy of the circulation of the cutaneous and mucous system. I think it also clearly results from the facts observed during this epidemic, that though more general, more sudden, and more virulent, in certain low and humid or filthy localities, it often depends chiefly on atmospherical causes, since like influenza it attacks at once large bodies of human beings, who are situate at very distant and remote parts of a community, and parts also widely differing in physical and local peculiarities.

If it be asked how we are to explain the comprehensive and epidemic prevalence of the disease, I willingly acknowledge my inability, otherwise than by referring it to atmospherical causes. From this, however, it does not result that we are to assume the presence of a contagious principle. The first step in the investigation of causes is to divest the subject of every assumption and every principle not susceptible of strict demonstration, and,

by excluding every inference of partial application, to confine the inquiry within the narrowest possible limits.

I have further to observe, that, connected with the habitudes and modes of living of the individuals, there are other circumstances which operate very powerfully as predisposing and exciting causes. The influence of some of these may be understood from the account of the morbid appearances found in the bodies of those cut off by the disease, the general tendency of which is to show that morbid states of certain organs, and correspondent dynamic disorder, constitute powerful predispositions to choleric attacks. With the view of rendering the influence of age, sex, and habits more distinct and obvious, I have now to subjoin the following statements.

The proportion of females attacked by cholera was much larger than of males. It is unfortunate that the sexes and ages are not always specified in the general reports, so that we are precluded from giving exact results from the whole epidemic. I shall, however, give the results obtained by the admissions into the Castle-Hill Hospital; and I think they were kept with such care that just reliance may be placed on them.

The total number of females attacked was 199. Of these *forty-one* either were, or stated themselves to be, married; *thirty-eight* were in the avowed character of public women; *eight* were in the condition of those who had been public women; *two* were of loose characters, though not avowedly public; *five* were in circumstances of extreme indigence; and all the residue were either unmarried, widows, or persons of whom no satisfactory statement was given. Of the whole 199, *forty-one* were habitually intemperate and drunkards; and this class generally included the whole of the public females, who, indeed, were in general the most miserable and depraved-looking wretches that could be seen. Of these, ten at least were sent from the Police Office, or picked up in the streets. From the latter class, combined with that of widows and indigent women in general, the mortality chiefly resulted.

Of married women attacked after their husbands, besides the instance of Mrs Murray already mentioned, I can find only three unequivocal examples, which occurred in Mrs Macpherson, Mrs Weir, and Mrs Furlough.

The entire number of men attacked was 118. Of these *twenty-one* were habitually intemperate and irregular; *eight* addicted to the excessive use of ardent spirits; and *three* had been drunk for several days previous to the attack. Of other persons, of whose previous habits no information could be obtained, six were sent from the Police Office, and two were picked up in the street. There is no reason to believe that those circumstances indicate the sobriety of these persons.

It was not an object of particular inquiry to ascertain whether the male patients were married or had relatives. But we have at least twenty-three instances of married men whose wives or children were not affected by the disease. The wives of Thomas Phillip, Robert Spiers, Andrew Butler, Matthew Girvan, John Gillies, Kenneth Forbes, and Alexander Blackburn; the daughters of Alexander Haigg, and Fergus Gunn, the sister of William Scott, the elder sister of the three Denhams, and the brother of Alexander Gordon, of which cases all except three were fatal, attended their respective relatives assiduously throughout the course of the disease, yet never presented a single symptom.

With the view of demonstrating the connection between age and the liability to the attacks of epidemic cholera, I may subjoin the following results.

Of 199 females the numbers attacked and destroyed, according to the ages, were:—

	Ages.	Attacks.	Deaths. 1 of 10 months.
From	1 to 10	9	3
	10 to 20	23	4
	20 to 30	47	17
	30 to 35	21	15
	35 to 40	27	15
	40 to 50	39	28
	50 to 60	19	15
	60 to 70	7	6
	70 to 80	6	3
	not marked	1	1
		—	
		199	

Of 119 males attacked and destroyed by the disease, the ages were the following:

	Ages.	Attacks.	Deaths. 1 of 6 months.
From	1 to 10	14	9
	10 to 20	13	8
	20 to 30	14	8
	30 to 35	11	9
	35 to 40	16	10
	40 to 50	18	9
	50 to 60	19	14
	60 to 70	8	3
	70 to 80	5	5
	not marked	1	1
		—	
		119	

From these tables it would result that the greatest numbers attacked were among the women between the ages of 20 and 40; that the chance of attack is as great between 20 and 30 as between 30 and 40; that the liability between 50 and 60 is nearly equal to that between 10 and 20; and that the liability is diminished below 10 and above 60.

Among males, in like manner, the greatest numbers are attacked between 40 and 60; and the numerical liability is nearly equal between 35 and 40, 40 and 50, and 50 and 60.

The mortality among the females was greatest between 30 and 40, less between 40 and 50, and nearly the same between 10 and 20 as between 50 and 60.

The mortality among males was most remarkable between 30 and 40 and 40 and 50; next between 50 and 60, then between 10 and 20.

IV. A single word may dispose of the subject of infection from the dead body. The number of bodies examined at the Castle-Hill Hospital was 54, of which 26 were inspected during the period when I had charge. In no case was any one either of those present or those occupied affected by the smallest symptom of the disease. We often commenced the dissections early in the morning, when it is commonly believed the body is peculiarly susceptible of infection; and the dissections occupied in general several hours daily. If complete exposure, therefore, were required, this could not fail to constitute it. Results equally conclusive were obtained at the other hospitals at which subjects were dissected with the same immunity. In short, this fancy of the dead subject infecting, which is physiologically impossible, and in some degree absurd, may be said to be proved experimentally to be quite unfounded. It is, nevertheless important to remark, that the proof or the refutation of the infection of the dead subject has nothing to do with the question of the infection of the living body; and attacks, even if occurring in this mode, prove nothing as to the contagious quality of the disease.



